REMARKS

Claims 20, 43, and 68 are amended in this paper. Claims 27 and 50 are cancelled. Accordingly, claims 20-26, 28-49, and 51-70 are now pending.

Claim Rejections Under 35 U.S.C. § 103

Claims 20-70 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,914,014 to *Kartchner* [hereinafter *Kartchner*] in view of U.S. Patent No. 6,583,394 to *Araya et al.* [hereinafter *Araya et al.*] and U.S. Patent No. 3,818,333 to *Walker* [hereinafter *Walker*]. This rejection is understood to be based on the premise that regarding claims 20, 43, and 68, *Kartchner* discloses a demulsification arrangement to remove microwave-absorptive material from a substrate comprising a containment structure and an RF applicator delivered from the power source operatively coupled and positioned within the containment structure and comprising an antenna body defined as a waveguide having a longitudinal axis along the RF energy. The rejection is understood to be based on the further premise that *Kartchner* discloses an antenna having RF transparent, cylindrical windows and apertures or windows that may be rectangular in shape. *Araya et al.* is cited as resolving the level of ordinary skill in the art and as evidence of obviousness and is asserted to teach, in Figure 4, a waveguide antenna applicator defined as slotted waveguides 12a arranged with slots perpendicular to the axis. The rejection is further understood to be based on the premise that it would have been obvious to employ such a waveguide in lieu of the cylindrical waveguide in *Kartchner*. *Walker* is cited as showing how an apertured applicator is tapered from the generator outward for presenting the desired mode of radiation.

Applicant traverses the rejection. Claims 20, 43, and 68 have been amended to recite that the RF applicator includes "an RF transparent antenna enclosure formed proximate the antenna body to substantially seal the antenna body from an environment external to the RF applicator." By contrast, in *Kartchner*, the microwave energy is deflected by angled deflector plates through microwave transparent windows

into dual feedstock chamber spaces. The structure in *Kartchner* lacks an RF transparent antenna enclosure that substantially seals an antenna body from the external environment. The waveguide antenna disclosed in *Araya et al.* also lacks such an antenna enclosure. Indeed, the disclosure of *Araya et al.* is directed to a kiln for firing ceramics. The waveguide antenna disclosed in *Araya et al.* is typically located in an ambient environment primarily consisting of air and therefore does not require sealing from the external embodiment. Similarly, in *Walker*, the transmitting and receiving antennas are mounted outside the container and also do not require sealing from the external embodiment. The invention articulated in claims 20, 43, and 68 is distinct from the systems disclosed in *Kartchner*, *Araya et al.*, and *Walker* in that it includes an antenna body that is submerged in an emulsion. Sealing the antenna body from the external environment is an important improvement because it prevents the emulsion from entering the antenna body and potentially altering its radiating characteristics.

Accordingly, Applicant respectfully submits that claims 20, 43, and 68 recite elements that are not disclosed or suggested by *Kartchner*, *Araya et al.*, or *Walker* considered separately or in combination. Thus, claims 20, 43, and 68 are patentably distinct from *Kartchner* in view of *Araya et al.* and *Walker*. Applicant respectfully requests that the rejection of claims 20, 43, and 68 under 35 U.S.C. § 103(a) be withdrawn.

Claims 21-26, 28-42, 44-49, 51-64, and 69-70 further define various features of the invention above the prior art and incorporate all of the limitations recited in claims 20, 43, and 68 from which they respectively depend, either directly or via intervening claims of intermediate scope.

In particular, claims 21 and 44 further recite that the antenna body is tapered along the longitudinal axis. Neither *Kartchner* nor *Araya et al.*, considered separately or in combination, discloses or suggests the use of a tapered antenna body having slots that are non-uniform in size. While *Walker* is cited as disclosing a tapered antenna body, the antenna body in *Walker* is not substantially sealed in an RF transparent

antenna enclosure as recited in claims 20 and 43.

Claims 22 and 45 further recite that the antenna body is tapered from one cross-sectional area at an end proximate to the RF generator to a smaller cross-sectional area at another end distal from the RF generator. Neither *Kartchner* nor *Araya et al.*, considered separately or in combination, discloses or suggests the use of an antenna body that is tapered from one cross-sectional area at a proximal end of the antenna body to a smaller cross-sectional area at the distal end of the antenna body, and that has slots that are non-uniform in size. While *Walker* is cited as disclosing a tapered antenna body, the antenna body in *Walker* is not substantially sealed in an RF transparent antenna enclosure as recited in claims 20 and 43.

Claims 23 and 46 further recite that the antenna body comprises a plurality of walls that form a rectangular cross-section. Neither *Kartchner, Araya et al.*, nor *Walker*, considered separately or in combination, discloses or suggests the use of an antenna body that comprises a plurality of walls that form a rectangular cross-section, and that has slots that are non-uniform in size.

Claims 24 and 47 further recite that the slots are defined by each of two parallel faces. As discussed above, *Kartchner* is silent as to whether the applicator waveguide 16 has slots at all. In addition, while the waveguides shown in Figure 4 of *Araya et al.* are illustrated as having slots, there is no disclosure as to whether the slots are defined by each of two parallel faces. Applicant notes that, in the configuration shown in Figure 4, the waveguides 12a "are positioned to direct power through kiln roof 26a." See column 7, lines 8-9. With the waveguides 12a positioned in this manner, that is, above the kiln roof 26a, it is logical to surmise that there is no need to direct power away from the kiln roof 26a, and thus no need for slots facing away from the kiln roof 26a. Accordingly, it is Applicant's belief that the waveguides 12a shown in Figure 4 of *Araya et al.* only have slots formed on the face that face toward the kiln roof 26a. With respect to *Walker*, Applicant respectfully submits that the antenna structures do not appear to be illustrated as having slots at all.

Claims 25 and 48 further recite that the antenna body comprises two walls

formed from an RF opaque material. Neither *Kartchner*, *Araya et al.*, nor *Walker*, considered separately or in combination, discloses or suggests the use of an antenna body comprising two walls formed from an RF opaque material, having slots that are non-uniform in size.

Claims 26 and 49 depend from claims 25 and 48, respectively, and further recite that the walls are formed from aluminum. Neither *Kartchner*, *Araya et al.*, nor *Walker*, considered separately or in combination, discloses or suggests the use of an antenna body comprising two aluminum walls, having slots that are non-uniform in size.

Claims 28 and 51 further recite that the RF applicator comprises an RF transparent window arrangement disposed proximate the outer surface of the antenna body and arranged to cover the plurality of slots. Claims 29 and 52 depend from claims 28 and 51, respectively, and further recite that the RF transparent window arrangement comprises a plurality of RF transparent windows formed from a material having a low dielectric constant. Claims 30 and 53 depend from claims 29 and 52, respectively, and further recite that the RF transparent windows are formed from fiberglass or TEFLON® polytetrafluoroethylene. As discussed above, *Kartchner* is silent as to whether the applicator waveguide 16 has slots, and therefore does not teach the use of an RF transparent window arrangement arranged to cover a plurality of slots. *Walker* also does not disclose the use of a slotted waveguide. *Araya et al.* contains no disclosure relating to RF transparent windows.

Claims 32 and 55 further recite that at least some of the slots have sizes that increase with increasing distance from the RF generator. As discussed above, *Kartchner* is silent as to whether the applicator waveguide 16 has slots at all. The antenna structure of *Walker* is illustrated without slots. *Araya et al.* contains no teaching regarding using slots that have sizes that increase with increasing distance from the RF generator.

Claims 34 and 57 further recite that the slots are uniformly spaced apart from one another along the length of the antenna body. By contrast, *Araya et al.* teaches a "graduated distribution of slots with increasing distance from the source" rather than a

uniform spacing of slots. See column 8, lines 19-21. As discussed above, *Kartchner* is silent as to whether the applicator waveguide has slots at all, and *Walker* appears to disclose a non-slotted antenna.

Claims 35 and 58 further recite a cap coupled to an end of the antenna body distally located from the RF generator. Claims 36 and 59 depend from claims 35 and 58, respectively, and recite that the cap is arranged to reflect an RF signal propagated within the antenna body to generate constructive interference. Claims 37 and 60 depend from claims 35 and 58, respectively, and recite that the cap is formed from aluminum. By contrast, neither *Kartchner*, *Araya et al.*, nor *Walker*, considered separately or in combination, discloses or suggests an antenna body having a cap coupled to an end distally located from the RF generator.

Claim 38 further recites that the antenna body comprises first and second faces that are spaced apart from one another and in which the slots are formed, the slots being arranged so as to radiate the microwave energy over substantially less than a 360° arc outward from the RF applicator.

Claim 39 further recites a control arrangement operatively coupled to the RF generator. Neither *Kartchner*, *Araya et al.*, nor *Walker*, considered separately or in combination, discloses or suggests a control arrangement used in conjunction with an RF applicator having an antenna body that has slots of non-uniform size.

Claim 40 further recites an outlet port formed on the container. *Araya et al.* is concerned with ceramic processing, not treatment of emulsions, and contains no teaching relating to an outlet port. *Kartchner* fails to disclose or suggest a demulsification arrangement that includes a container having an outlet port and an antenna body that has slots of non-uniform size, as *Kartchner* is silent as to whether the applicator waveguide 16 has slots at all. *Walker* discloses an antenna structure lacking slots.

Claims 41 and 61 further recite that the microwave-absorptive material comprises a hydrocarbon. Claims 42 and 62 further recite that the substrate comprises water. *Araya et al.* is concerned with ceramic processing, not treatment of emulsions,

and contains no teaching relating to either a microwave-absorptive material comprising a hydrocarbon or a substrate comprising water. *Kartchner* fails to disclose or suggest a demulsification arrangement that is used to separate an emulsion of a hydrocarbon and water and that includes an antenna body that has slots of non-uniform size, as *Kartchner* is silent as to whether the applicator waveguide 16 has slots at all. *Walker* discloses an antenna structure lacking slots.

Claim 63 further recites that the treatment volume can be either an underground treatment volume or an above-ground contained treatment volume. Claim 64 depends from claim 63 and further recites that the above-ground contained treatment volume comprises a container to receive the emulsion. The container has at least one outlet port defined by a wall of the container. *Araya et al.* is concerned with ceramic processing, not treatment of emulsions, and contains no teaching relating to either an underground treatment volume or an above-ground contained treatment volume. *Walker* describes a microwave window and antenna apparatus for measuring the moisture content of "fluidized" material including particulate material, such as sand, or liquid material, such as oil, and is not concerned with demulsification of such materials. In addition, *Walker* employs an antenna structure that does not have slots. *Kartchner* fails to disclose or suggest a demulsification arrangement that includes an above-ground contained treatment volume and an antenna body having slots of non-uniform size, as *Kartchner* is silent as to whether the applicator waveguide 16 has slots at all. Further, *Kartchner* discloses a system that uses a particular arrangement and configuration of feedstock treatment chamber spaces. "The dimensions of the dual process chambers are chosen to maximize a multimode resonant pattern at the working radio frequency and feedstock dielectric characteristics." See column 4, lines 30-33. Thus, *Kartchner* is completely inapplicable to underground treatment volumes, which typically have much less controlled dimensions.

Claims 69-70 further define various features of the invention above the prior art and incorporate all of the limitations recited in claim 68, from which they depend. Accordingly, claims 69-70 are patentable in view of the prior art of record.

In view of at least the above reasoning, Applicant respectfully requests that the rejection of claims 20-70 under 35 U.S.C. § 103(a) as unpatentable over *Kartchner* in view of *Araya et al.* and *Walker* be withdrawn.

Conclusion

The amendments to the claims presented above are believed to place the application in condition for allowance. Applicant respectfully requests a timely Notice of Allowance.

Respectfully submitted,

for the Applicant
by attorneys,

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